



QUALITY ASSESSMENT MODEL OF RAMBAK SAPI PRODUCTS WITH *FAULT TREE ANALYSIS* METHOD IN JEMBER REGENCY

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Abstract

This research aims to analyze and design the fault tree analysis model effect on quality assesment of UD Aduhai rambak product in Mangli Village, Kaliwates subdistrict, Jember Regency. This is included as survey research with research subject. In this explorative research, the writer tried to obtain information about the performance of UD Aduhai and the fault tree or quality failures will be recommended to find alternative way to fix the rambak roducts quality failures of UD Aduhai, Mangli Village, Kaliwates Subdistrict, Jember Regency. The sampling method used purposive sampling or sampling with certain consideration. The sample of this research was 1 producer, 1 worker of the rambak company, and 20 consumers of Aduhai rambak product. The data collected were primary and secondary data. The analysis technique is the fault tree analysis model to design and identify the rambak product quality failures.

The discussion result were the performance dimension indicator (different texture/shape), the cutting process did not follow the ideal size. From the aesthetics dimensions, the immersion process did not follow the ideal seasoning composition and ideal immersion duration. From the conformance dimension (product safety) especially the final product.

Key word : Fault Tree Analysis, Performance Dimensions, Aesthetic Dimensions, conformance dimenstion

1. Introductions

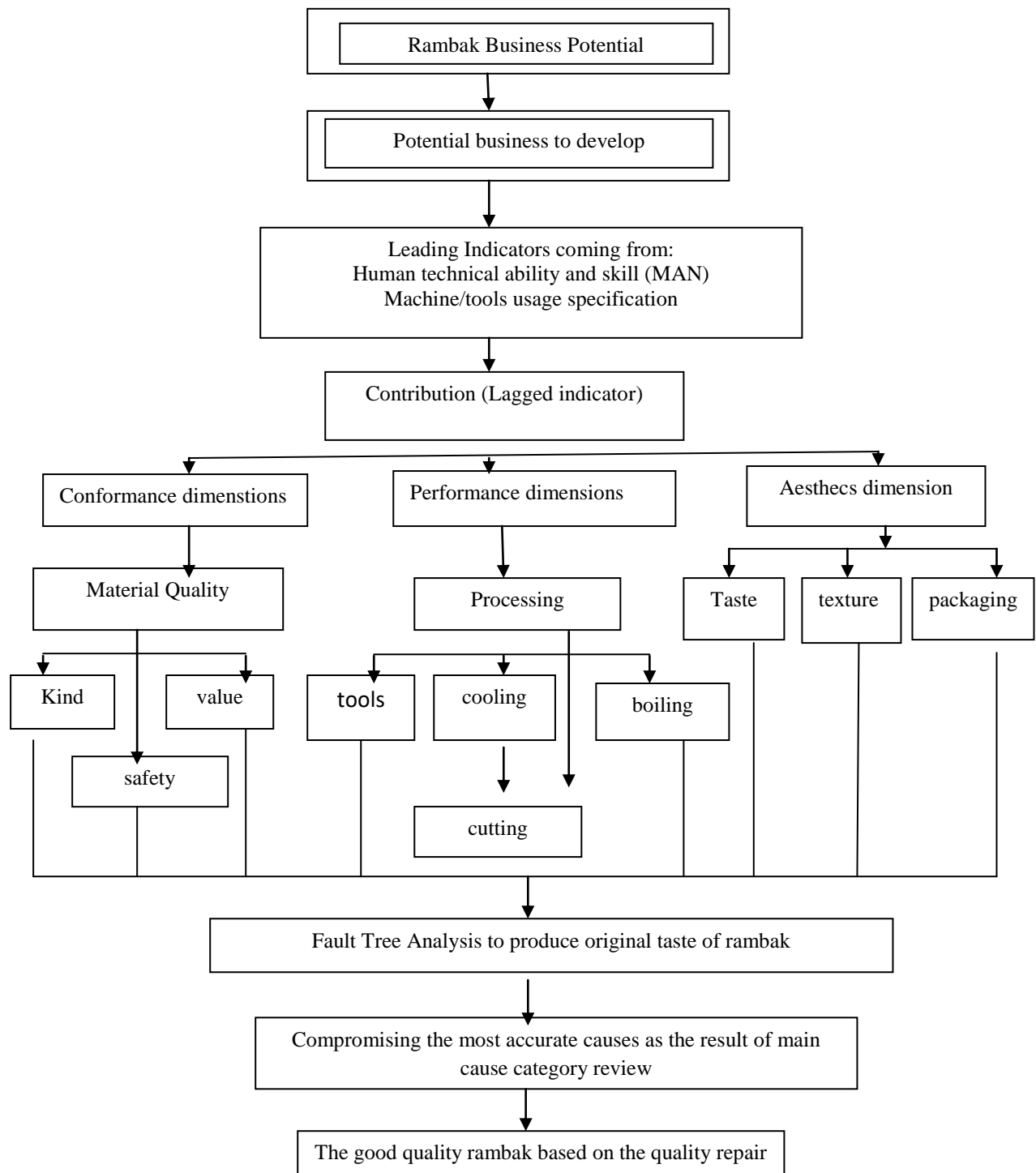
Kerupuk agroindustry is one of potential industry to be developed especially in Jember Regency, because kerupuk is the iconic and the most favorited side dish in Indonesia. Still, there is no any quantitative data which describe the number of kerupuk consumption. Thus, it can be considered that the consumption level of kerupuk in Indonesia is relatively high. About the demand, considering the population and life quality increase therefore the demand of the product will rise. Based on the research of kerupuk's nutritional essence composition for cow skin kerupuk or rambak, it contained approximately 80,01-82,91 grams of protein. This data showed that the protein number is greater than the carbohydrate. (Adityani, 2012).

Kerupuk is one of processed agricultural products produced by Jember society, especially in Mangli Village, Kaliwates Subdistrict which is one of potential home industry since kerupuk is one of the most comprehensive and prospective commodities to develop and contribute significantly to the labor around the industrial site. For example is "UD ADUHAI", one of starch crackers and cow skin crackers (rambak) home industry. The rambak products of UD Aduhai was distributed mostly in Jember.

Along with the competitive business, the rambak industry has to be able to compete the rambak business competition. One of them is finding out the lagged indicator (rambak product quality failures) and leading indicator (primary and secondary factors of rambak product quality failures) to improve the product quality. Those indicators were then arranged into a fault tree analysis to remove the quality failures of rambak products. This research aims to produce crunchy rambak and increase its original taste and aroma. In this research, the fault tree or quality failures will be recommended to find alternative way to fix the rambak products quality failures of UD Aduhai, Mangli Village, Kaliwates Subdistrict, Jember Regency.

2. Research Design

This research is considered as survey research with rambak producers as the research subject. This is an explorative research to gain more information about rambak industry performance of UD Aduhai in Mangli Village, Kaliwates subdistrict, Jember Regency which will be recommended to the rambak industry. The population of this research are rambak industries in Jember Regency. The sampling technique is without probability, that is the purposive sampling or certain consideration sampling method.



Gambar 1. Research Design Chart

3. RESULT AND DISCUSSION

3.1 *RESULT*

3.1.1 *Consumer Expectation Identification*

Based on the result of interview and product identification to the consumer, from several questions given to the respondents by referring to the aesthetics dimension indicator consist of taste, texture, and packaging; conformance dimension consist of product safety, there obtained:

The consumer expectation criteria on UD ADUHAI rambak products are:

- a. The rambak has its original delicious and tasty taste of rambak.
- b. The rambak of UD Aduhai has thin, crisp, and dense texture.
- c. The rambak of UD Aduhai is not well packaged and the plastic wrap is too thin that it is easy to torn.
- d. The product safety of UD Aduhai rambak is not quite good since the consumer asses the safety from the package which is not quite clean.
- e. The product label has been considered suitable for the small package of rambak from UD Aduhai because it was customized with the per unit price.
- f. Aduhai rambak has not get the PIRT (Produk Industri Rumah Tangga / Home Industry Product) permission issued by Jember Health Institute which is the food certificate for food and beverages producer. The PIRT number then published on the product package to guarantee or give trust to the prospective consumer or stores and supermarket about the product offered. The PIRT for food should be attached to the distributed products.
- g. The aroma of UD Aduhai rambak has been suitable with the original slight aroma of cow skin. The cow skin aroma was only added a slight since the cow skin price is relatively high that UD Aduhai give 30:70 proportion of cow skin and tapioca.

3.1.2 *Product Quality Identification*

The Result of Identifying Rambak Product Qualification

The identification was conducted by analyzing the rambak quality of UD Aduhai. The analysis result on table 4.1 explained that the rambak quality of UD Aduhai has been suitable with the consumer expectation by giving (√) sign on the column and (x) sign for answering the unexpected quality on the column. For more detail, please check table 1.

Table.1 Consumer opinion on UD Aduhai rambak product

No	Respondent	UD Aduhai Rambak Product				
		Consumer Satisfaction				
		1	2	3	4	5
1	Rifki	√	√	X	X	X
2	Edy Hartono	X	X	√	√	√
3	Oryza	X	X	X	X	√
4	Janayi Firdaus	X	X	X	√	X
5	Wendy	√	√	X	X	√
6	Farida	√	√	√	X	√
7	Helmi	√	√	X	X	√
8	M Alfian	X	√	√	X	√
9.	Ayudiyah	√	√	√	√	X
10	Abidah	√	√	X	X	√
11	Sukma	√	√	X	X	√
12	Wida	√	X	X	X	√
13	Junaidi	X	√	X	X	X
14	Tuti	√	X	X	X	√
15	Nurhayati	√	X	√	X	√
16	Anira	√	X	X	X	√
17	Siti	√	X	X	X	√
18	Sigit	X	X	X	X	X
19	Rizal maulana	X	√	X	X	√
20	Tutiani	√	√	X	X	√

Primary data source, 2018

*Quality description of rambak based on consumer expectation

1=taste, 2=texture, 3=packaging and label, 4=food safety, 5=aroma

Based on the table above, it can be concluded that respondents' answer about the taste was 13 said it is suitable, and 7 said not suitable with the rambak product, from the texture, 11 respondents stated that it was like what they have expected and 9 stated no. From the packaging and label, 5 respondents stated it was suitable while the other 15 stated it was not. From the food safety, 3 respondents stated it was suitable and the rest 17 stated it was not. From the aroma, 5 stated it was not like what they have expected while the other 15 stated it was what they have expected.

3.1.3 Production Quality Identification

The next step, after identifying the product mismatch on production quality by identifying the cause indicator, is identifying the cause of failures on rambak product related to the production process. The identification result was shown on table 2:

Table 2 The Mismatch Identification on UD Aduhai Rambak Product Production Quality

Worker	Material	Tools	Processing
–	+	–	+

Primary Data, Interview, 2018

*The mismatch description on rambak products:

+ = appropriate

– = inappropriate

WORKERS

UD Aduhai produce approximately 2 Quintals of rambak in a week assisted with 21 workers. The number of workers and the job description can be seen on the following table:

Table. 3 Number of Workers and the job description

No	Number of Workers	Sex	Education	Section	Description
1	13	F	Primary School Graduates	Packaging	Packaging the fried rambak
2	2	F	Primary School Graduates	Frying	Frying the dried cow skin into rambak
3	6	F = 3 M = 2	Secondary School Graduates	Processing	Selecting the material, cow skin washery, boiling (cow skin stewing), cooling (the drainage process), cutting (based on the fixed size), and mixed immersion with the seasoning.

Data source: Interview, 2018

The UD Aduhai workers for the packaging section mostly came from Arjasa and the region surround the UD Aduhai, the frying workers were from the region ssurround UD Aduhai, and the workers for production process such as material selection and mixed immersion with seasoning was handled by Mr. Edwin as the owner, while other production process was handled by other workers included the owner's relations and family.

MATERIAL

The excellent cow skin was selected as the material of rambak product. The quality of rambak shape was determined by the cow skin sheet quality. The cow skin sheet used for rambak production was imported from Sukorejo Village, Pasuruan city.

TOOLS

Here are the tools used in rambak production:

1. Frying tools
2. Manual scissor for cutting the cow skin
3. Immersion bath tub
4. Washery bath tub
5. Firepalce for frying
6. Drier tools in the form of large napkin for drying the cow skin under the sun
7. Traditional sealer made from square metal plate heated on the ember/charcoal.

The following figure is the production proccess chart of rambak:

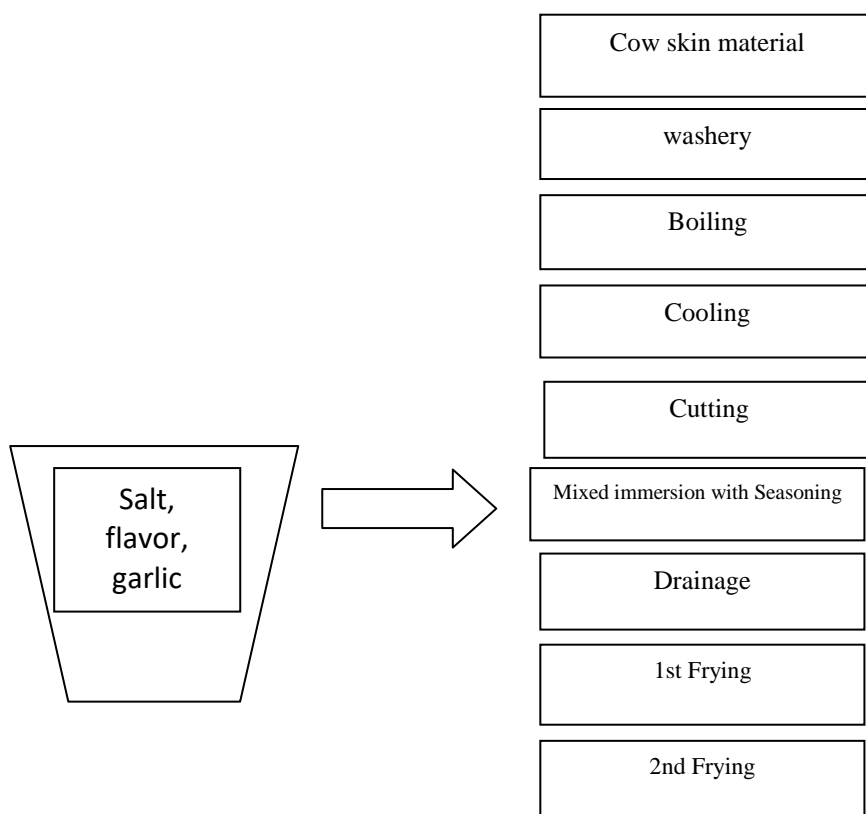


Figure 1. Rambak Production Chart

Rambak Production Process Description

The cow skin was washed by the flowing water with double cleaning. This was aimed to cleaned the sticky dirt on the cow skin which will stick on until the frying process.

The cow skin boiling is a boiling process to increase the skin absorbence on the seasoning. The boiling process was conducted depends on the cow skin condition, if the cow skin had thick and stiff texture, then the boiling will take more time to soften the skin. In other hand, if the cow skin was thinner, the boiling will only take a short time. The cow skin boiling needes approximately 2 hours with average temperature of 90 degrees Celcius. To find out whether the cow skin has been well-soften or not, it can be checked by pocking the skin or other similar ways.

The cow skin cooling was aimed to ease the cutting process based on the standard. The cooling process was lying the skin at the open space to boost the cooling process. The cooling process usually needs approximately 1 hour.

The cutting process was conducted after the cooling process. The cow skin will be cut with the dimension of 1,5 cm length and 0,5 cm width. The size has been suitable with the distribution price and packaging.

The cow skin mixed immersion with seasoning was conducted after the cutting process. The immersion was performed to add the salty and delicious flavor by mixing the garlic, salt, and other seasoning to produce a tasty rambak without removing the original aroma of cow skin and having a fit flavor, not too salty or plain. The immersion process usually needs approximately 1 hour to make sure the seasoning has been well-absorbed by the cow skin.

The drainage process is drying the cow skin which have been immersed with the seasoning. The cow skin will be dried under the sunlight, and if it is not possible to utilize the sunlight, the producer will use the indoor manual oven using gas and metal plate to produce heat to dry the cow skin. However, the drainage by using manual oven is not efficient compared to the darainage using the sunlight. If the sunlight drainage process failed, it will affect the shape of the cow skin when entering the frying process. The ideal drying prcess takes one day. If the sunlight drying process get some troubles, the drying process will take 2 days. If the drying process cannot be performed perfectly, and the cow skin was still half-wet, the process was continued by putting the skin on the manual oven.

The frying process is frying the dried cow skin. The frying was performed twice. The first frying was performed with approximately 70-80 degrees celcius for about 25-30 minutes. Then continued by the second frying with higher temperature, approximately 100 degrees celcius until the rambak swell.

3.1.4 Fault Tree Analysis of Rambak Product Failures

The initial step of fault tree analysis is creating the fault tree analysis framework which is the identification step of the rambak quality failures by providing a short description about the leading indicator and the sub-leading indicator of rambak quality failures, and the correction action needed to overcome the failures. The fault tree analysis framework is used to describe the problems, impact, and the problem solving for the product failures.

The fault tree analysis framework description was explained more detail at the fault tree diagram to obtain the cause of each indicator by relating the product failures to a logic gate. Fault tree diagram with rambak quality failure was shown at figure 1.

After learning the leading indicator and sub-leading indicator and the further impact, then creating the problem solving formulation to overcome the failures.

Table 4. UD Aduhai Rambak Product Quality Failures cause Identification and Correction Action (Fault Tree Analysis Framework)

<i>Legged Indicators</i>	<i>Leading Indikator</i>	<i>Sub-leading Indicators</i>	<i>Correction Actions</i>	<i>Effects</i>
Product failures on: 1. <i>Performance Dimensions</i> (cow skin cutting) 2. <i>Aesthetics Dimensions</i> (the taste is too salty) 3. <i>Conformance Dimentions</i> (Product safety)	1. The cutting process did not based on the standard (inappropriate)	a. Ineffective tools b. Careless worker	a. A fixed standard for cutting b. Using the modern cutting tools c. Continuous supervision for cutting	a. No standard on the taste, shape, size, and the plastic pack is easily torn.
	2. Mixed immersion with seasoning	a. There is no standard for the seasoning proportion b. The workers failed to follow the mixed immersion with seasoning standard	a. A fixed standard for seasoning mix b. Supervise the immersion process	b. Customer Complain
	3. Product Safety	a. The product has no PIRT permission b. No standard in the plastic usage c. The traditional sealer usage	a. PIRT registration to the local branch Health Institution b. Change the plastic packaging c. Using modern sealer	c. Decrease on the rambak product purchase interest.

Data source: Interview, 2018

1. Reviewed Performance Dimension

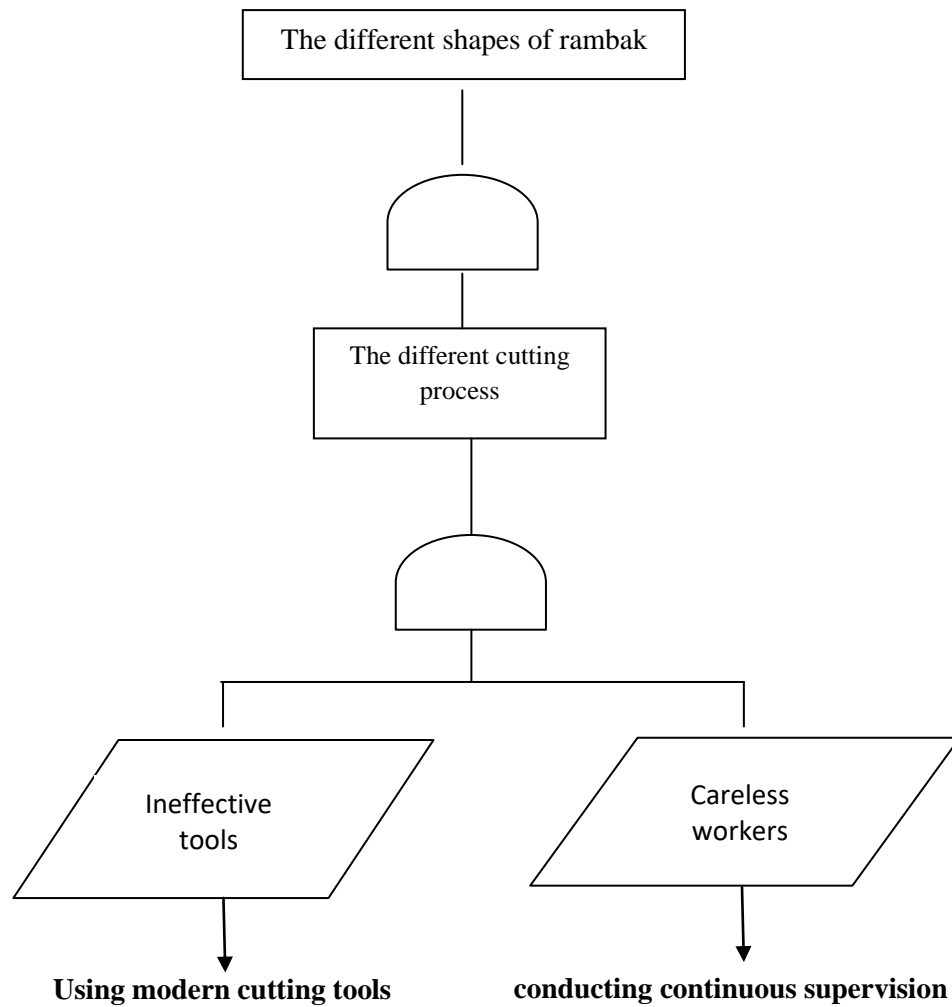


Figure 2. Model Performance Dimension

2. Displayed Aesthetics Dimensions

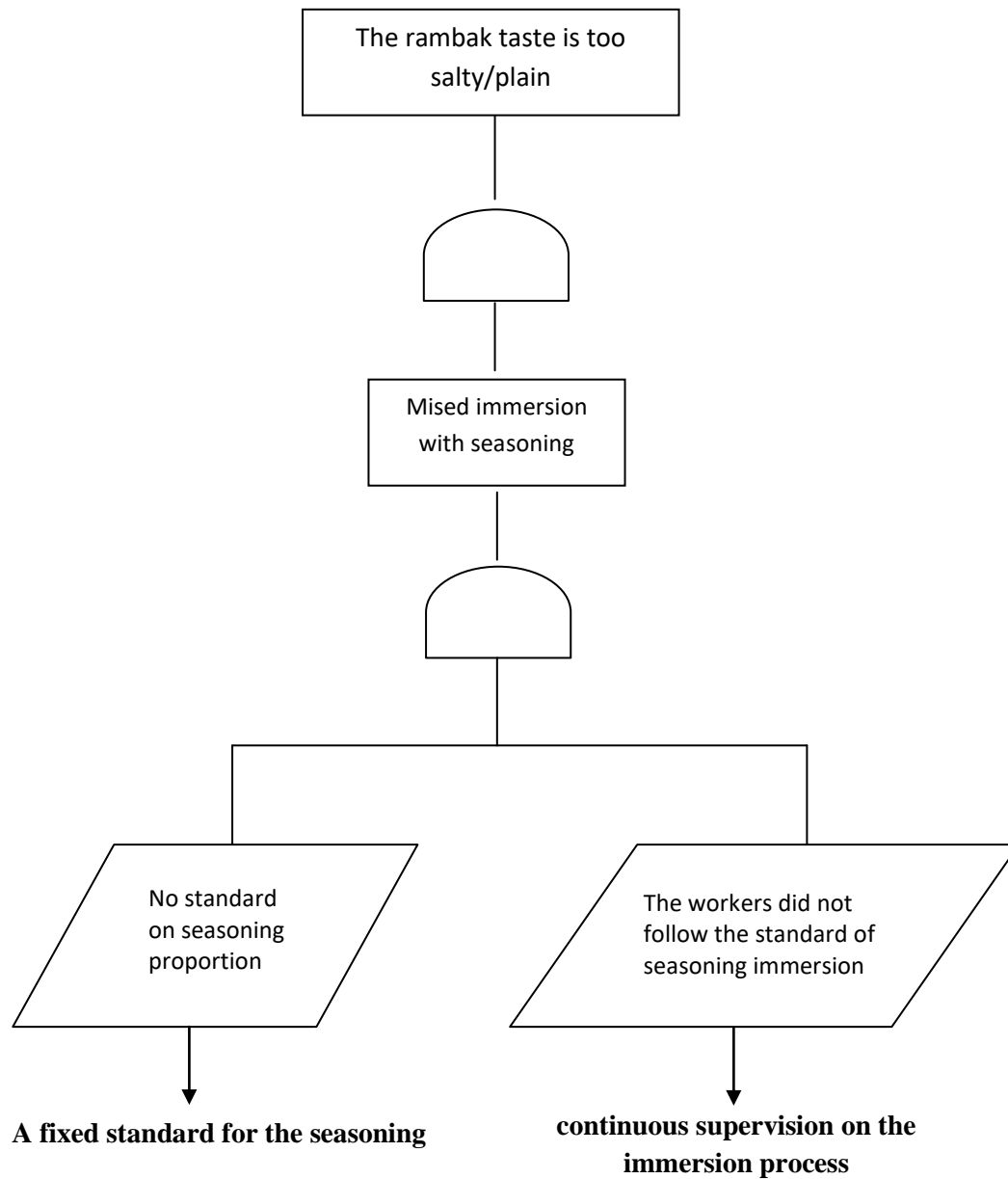


Figure 2. Model Aesthetics Dimensions

3. Conformance Dimension (product safety)

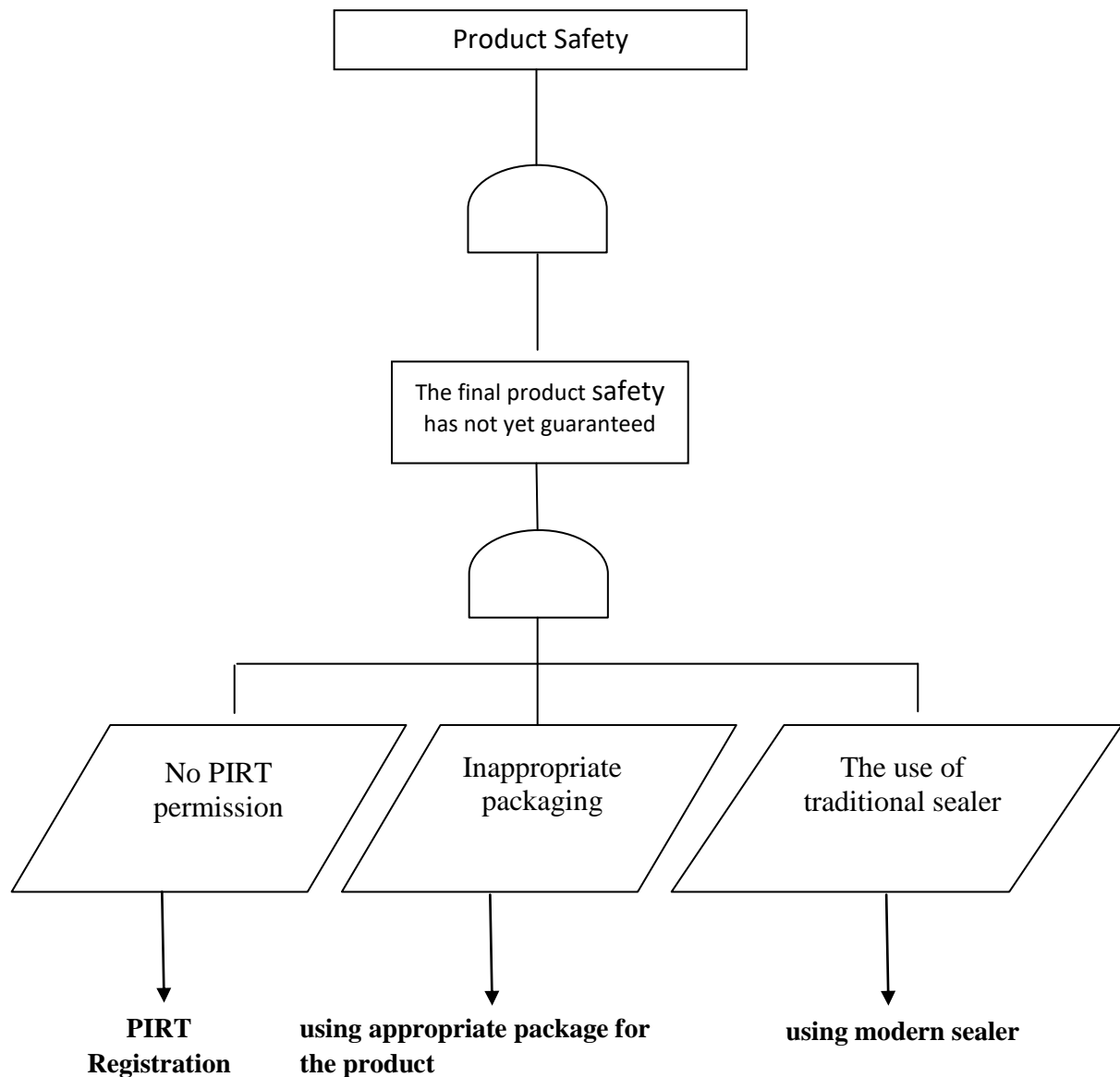


Figure 3. Model Conformance Dimension

3.2 DISCUSSION

3.2.1 *Product Failures Causes*

3.2.1.1 *The cause of Performance Dimension indicator failures*

Based on the analysis result, there were failures (legged indicators) on the rambak product on its Performance Dimension indicators (different texture). The failure was caused by the errors during the production (leading indicators), and the sub-Leading indicators obtained were as in the following:

1. In this stage, the product failure was caused by the Performance Dimension indicators (different texture/shape) because one of the causes or all is caused by the standard unavailability for the cutting.
2. Leading indicator 1: the cutting process failure was caused by the ineffective cutting tools and careless workers.
 - 1) The first sub-leading indicators, the use of non-standard cutting tools which affect on the rambak shape and texture difference.
 - 2) The second sub-leading indicators, the worker were careless in cutting the cow skin. The ideal size of the rambak is 1,5 cm length, and 0,5 cm width, however, most of the rambak have different size which resulted on the different number of rambak in one pack.

3.2.1.2 *The cause of Aesthetics Dimension indicator failures*

Based on the analysis result, there was a failure (legged indicators) on the rambak product on its Aesthetics Dimension indicators (the taste is too salty or plain). The failure was caused by the errors during the production (leading indicators), and the sub leading indicators obtained were as in the following:

1. Leading indicators 1: there was no standard in the seasoning immersion process and the workers did not follow the standard of immersion duration.
 - 1) The first sub leading indicators, there was no standard on the seasoning proportion which consist of salt, garlic, and other seasonings. So, there was not a fixed standard for seasoning composition at UD Aduhai.
 - 2) The second sub leading indicators, the worker were careless in executing the immersion process which usually needs approximately 1,5 hours could be less or more than the ideal duration. It was caused by the alarm/reminder unavailability at UD Aduhai.

3.2.1.3 *The cause of Conformance Dimension indicator failures (Product Safety)*

Based on the analysis result, there was a failure (legged indicator) on the rambak product on its Conformance Dimension indicator (Product Safety). The failure was caused by the errors during the production (leading indicator), and the sub-leading indicators obtained were as in the following:

1. Based on the analysis result, there was a failure (legged indicator) on the rambak product on its Conformance Dimension indicator (Product Safety), especially the final product. This caused the product safety has not been guaranteed yet.
2. Leading indicator 1: the rambak product safety has not been guaranteed yet since there is no PIRT permission on the product, the use of inappropriate plastic pack which cannot perfectly protect the product, and the use of modern plastic sealer.
 - 1) The first sub-leading indicator: the rambak product has no PIRT permission. It was caused by the long duration to get the PIRT and the PIRT processing fee is relatively high. Besides, the owner of UD Aduhai has not understood yet that the food product should have PIRT issued by the Industrial Service Institution.
 - 2) The second sub leading indicator: the product packaging use a very thin plastic of 0,3 mm that is easily torn and decrease the rambak crispness.

- 3) The third sub leading indicator: the use of traditional plastic sealer makes the sealing easily open. The traditional sealer was made from an oil lamp with low fire volume that it cannot fully stick the seal.

3.2.2 Causes Correction

3.2.2.1 Performance Dimensions Indicator

The problem of shape and size difference of rambak can be solved by using modern cutting tools and doing continuous supervision for example once in 4 hours and providing training for the new workers.

3.2.2.2 Aesthetics Dimension Indicator

The problem of taste difference on rambak (too salty or plain) can be solved by fixing the standard for the seasoning composition and immersion duration. The seasoning used on the immersion were salt, garlic, and other seasonings stirred with sufficient water. Besides, the continuous supervision and fixed standard for immersion were needed to avoid overtimed immersion as the result of reminder unavailability.

3.2.2.3 Conformance dimension Indicator

The problem of product safety can be solved by registering the product to the Industrial Service Institution to get the PIRT permission, using thicker plastic pack of 0,66 mm that will not easily torn. Besides, they need a modern plastic sealer to have better sealing quality.

4. CONCLUSION AND SUGGESTION

4.1 Conclusion

Based on the result and discussion at the previous chapters, it can be concluded that:

1. There were three causes of UD Aduhai rambak product quality failures and correction actions (Fault Tree analysis framework), they are Performance Dimension Indicator consist of the difference on the shape and size of the rambak. The Aesthetics dimension consist of unstandardized immersion process and seasoning composition and the carelessness of the worker in doing the immersion. And the conformance dimension indicator (Product Safety).
2. The prformance dimension indicators can be solved by improving the tools effectivity by using modern cutting tools and providing training for the workers to improve their skills in cutting the cow skin.
3. The Aesthetics Dimension indicator can be solved by fixing a standard for the seasonong composition and providing an alarm or reminder tools for the immersion section workers (SOP)
4. The Conformance dimension indicator can be solved by doing the PIRT registration, changing the plastic wrap type to keep the rambak crispy, and using the modern plastic sealer.

4.2 Suggestion

1. UD Aduhai should use the modern cutting tools and providing training to improve the new workers' skill in cutting process
2. UD Aduhai should standardize the seasoning composition and providing the reminder for the immersion duration (SOP)
3. UD Aduhai should register PIRT to the Industrial Service Institution, change the plastic wrap type to maintain the crispy rambak and provide a modern plastic sealer.
4. provide a modern plastic sealer.

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